PATENT ABSTRACTS OF JAPAN

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(54) PARAMETER ADJUSTING METHOD IN OPTICAL DISK REPRODUCING DEVICE, AND OPTICAL DISK REPRODUCING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a parameter adjusting method and a reproducing device using the same capable of removing the amount of variation caused by the rotational irregularity of a motor for rotationally driving a disk or caused by the surface wobbling of the disk, while suppressing that the detecting time of the jitter amount or the adjusting time of the parameter is excessively increased when the parameter is adjusted on the basis of the jitter amount.

SOLUTION: By changing values of the adjusting parameters at a prescribed step, the jitter amounts obtained for each value of the adjusting parameters are defined as primary jitter amounts, and a secondary jitter amount is calculated from the average (equivalent average or weighted average) of the primary jitter amounts corresponding to each value of the adjusting parameters and the primary jitter amounts corresponding to at least the values of the adjusting parameters before and after them, then the value of the adjusting parameter is adjusted in accordance with the secondary jitter amount.

CLAIMS

[Claim(s)]

[Claim 1]In a parameter adjustment method in an optical disk reproducing device which adjusts a parameter of playback equipment based on a jitter amount of a regenerative signal from an optical disc, Change a value of an adjust parameter at a predetermined step, detect a primary jitter amount to each value of an adjust parameter, and as a jitter amount to each value of an adjust parameter, A secondary jitter amount which is an average with a primary jitter amount corresponding to each value of an adjust parameter and a primary jitter amount corresponding to a value of an adjust parameter before and behind that at least is calculated, A parameter adjustment method in an optical disk reproducing device adjusting a value of an adjust parameter based on a secondary jitter amount.

[Claim 2]A parameter adjustment method in the optical disk reproducing device according to claim 1, wherein a primary jitter amount is the average of a jitter amount which carried out multiple-times detection while rotating an optical disc one time.
[Claim 3]A parameter adjustment method in the optical disk reproducing device according to claim 1 or 2 being what carries out weighting of the operation of a secondary jitter amount to a primary jitter amount which calculates at a predetermined rate, and calculates the average.
[Claim 4]A jitter amount detection means to detect a jitter amount of a regenerative signal which it began to read from an optical disc.
A parameter adjustment device which adjusts a predetermined parameter based on a jitter amount detected by a jitter amount detection means.
Are the above the optical disk reproducing device which it had, and a parameter adjustment device, Change a value of an adjust parameter at a predetermined step, input a primary jitter amount to each value of an adjust parameter detected by a jitter amount detection means according to it, and as a jitter amount to each value of an adjust parameter, A secondary jitter amount which is an average with a primary jitter amount corresponding to each value of an adjust parameter and a primary jitter amount corresponding to a value of an adjust parameter before and behind that at least is calculated, and a value of an adjust parameter is adjusted based on a secondary jitter amount.

[Claim 5]The optical disk reproducing device according to claim 4 considering a parameter adjustment device as an average of two or more jitter amounts detected by a jitter amount detection means while rotating an optical disc one time as a primary jitter amount.
[Claim 6]The optical disk reproducing device according to claim 4 or 5, wherein it should carry out weighting of the parameter adjustment device to a primary jitter amount which calculates at a predetermined rate as a secondary jitter amount and it shall calculate the average.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the method of adjusting parameter value especially based on a jitter amount, about the adjustment method of the various parameters adjusted in order to perform reproduction motion the optimal in an optical disk reproducing device.
[0002]
[Description of the Prior Art]In the optical disk reproducing device which plays information from optical discs, such as CD from the former, MD, and DVD, In order to perform reproduction motion of the optical disc with which it was equipped the optimal, the jitter amount (a part for the time change to the standard clock of the reproduction clock obtained from a regenerative signal) of the regenerative signal (RF signal) read from the optical disc is detected, Based on this jitter amount, the value of the various parameters in reproduction motion is adjusted automatically so that a jitter amount may serve as the minimum. as the parameter adjusted -- a focus bias pressure value (for example, JP,7-44882,A.) Referring to JP,9-44864,A, a focus offset value (refer to JP,11-191225,A), a gain, focus balance of a focus error signal, etc. are mentioned.
[0003]For example, drawing 2 shows the relation between focus balance and a jitter

amount typically, and expresses change of the jitter amount when changing focus balance. Changing focus balance here When calculating each output from the quadrisected photo sensor which detects the returned light (catoptric light) of the laser beam which it was provided in the optical pickup and irradiated by the optical disc in a predetermined combination and acquiring a focus error signal, it is making the gain at the time of an operation adjust (change).
It is changing the balance (for example, a center level; refer to drawing 3) of S character curve which a focus error signal presents by this gain adjustment.

[0004]And a focus balance value is adjusted to the thing corresponding to the point A noting that in the case of drawing 2 a jitter amount is the minimum in the point A and the state (here, a focus balance value is called) of the focus balance corresponding to the point A is in the optimal state for reproduction motion.
[0005]
[Problem(s) to be Solved by the Invention]Now, when a parameter is adjusted automatically as mentioned above based on the jitter amount of a regenerative signal, The value of parameters other than an adjustment object was made immobilization, it changed the value of the parameter of an adjustment object, detected the jitter amount at that time, and has determined the optimal parameter value (for example, parameter value in case a jitter amount serves as the minimum).
[0006]However, a changed part resulting from the face deflection of a changed part or a disk by the rotation unevenness of a motor which makes a changed part independent of the parameter which can serve as an adjustment object, for example, a disk, rotate is contained in the jitter amount detected when changing parameter value. For this reason, it was difficult to acquire the point that a jitter amount serves as the minimum in order to come to show actually the jitter amount obtained when changing parameter value in drawing 4 and to determine the optimal parameter value.
[0007]Then, it is considering it as a jitter amount [as opposed to / as opposed to / for detection of the jitter amount in each changed parameter value / a multiple-times deed / each parameter value for the average], when changing the parameter value made into an adjustment object and detecting a jitter amount conventionally, A changed part resulting from the face deflection of a changed part or a disk by the rotation unevenness of a motor which makes a disk rotate was removed.
[0008]However, in order to fully remove a part for the above change, it is necessary to take the average of detection (measurement) Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. for very many jitter amounts to one parameter value. therefore -- in order to obtain the jitter amount (what was averaged) to each parameter value for parameter adjustment, very many jitter amounts must be detected -- the increase of detection time of a jitter amount -- size -- as a result, increase of the adjusting time of a parameter was caused. And since such time turns into a user's waiting time, it is anxious for time reduction.
[0009]this invention -- **, suppressing that the detection time of a jitter amount and the adjusting time of a parameter become excessive, when it was made in view of the point [like] and a parameter is adjusted based on a jitter amount. It aims at providing the playback equipment using the parameter adjustment method and it which can remove a changed part called a changed part resulting from the face deflection of a changed part or a disk by the rotation unevenness of a motor which makes a disk rotate.
[0010]
[Means for Solving the Problem]A parameter adjustment method in an optical disk reproducing device of this invention concerning claim 1, It is a parameter adjustment method in an optical disk reproducing device which adjusts a parameter of playback

equipment based on a jitter amount of a regenerative signal from an optical disc, Change a value of an adjust parameter at a predetermined step, detect a primary jitter amount to each value of an adjust parameter, and as a jitter amount to each value of an adjust parameter, A secondary jitter amount which is an average with a primary jitter amount corresponding to each value of an adjust parameter and a primary jitter amount corresponding to a value of an adjust parameter before and behind that at least is calculated, and a value of an adjust parameter is adjusted based on a secondary jitter amount.

[0011]A parameter adjustment method in an optical disk reproducing device of this invention concerning claim 2 is characterized by a primary jitter amount being the average of a jitter amount which carried out multiple-times detection while rotating an optical disc one time in the invention according to claim 1.

[0012]In the invention according to claim 1 or 2, a parameter adjustment method in an optical disk reproducing device of this invention concerning claim 3 carries out weighting of the operation of a secondary jitter amount to a primary jitter amount which calculates at a predetermined rate, and is characterized by being what calculates the average.

[0013]An optical disk reproducing device of this invention concerning claim 4, A jitter amount detection means to detect a jitter amount of a regenerative signal which it began to read from an optical disc, Are a parameter adjustment device which adjusts a predetermined parameter based on a jitter amount detected by a jitter amount detection means an optical disk reproducing device which it has, and a parameter adjustment device, Change a value of an adjust parameter at a predetermined step, input a primary jitter amount to each value of an adjust parameter detected by a jitter amount detection means according to it, and as a jitter amount to each value of an adjust parameter, A secondary jitter amount which is an average with a primary jitter amount corresponding to each value of an adjust parameter and a primary jitter amount corresponding to a value of an adjust parameter before and behind that at least is calculated, and a value of an adjust parameter is adjusted based on a secondary jitter amount.

[0014]In the invention according to claim 4, an optical disk reproducing device of this invention concerning claim 5 considers a parameter adjustment device as an average of two or more jitter amounts detected by a jitter amount detection means, while rotating an optical disc one time as a primary jitter amount.

[0015]In the invention according to claim 4 or 5, an optical disk reproducing device of this invention concerning claim 6 should carry out weighting of the parameter adjustment device to a primary jitter amount which calculates at a predetermined rate as a secondary jitter amount, and should calculate the average.

[0016]

[Embodiment of the Invention]Drawing 1 is an outline lineblock diagram of the optical disk reproducing device concerning one example of this invention, and plays DVD and CD as an optical disc.

[0017]An optical pickup for the optical disc in which information was recorded 1, and 2 to read the information currently recorded from the optical disc 1, An RF amplifier for 3 to amplify the regenerative signal (RF signal) outputted from the optical pickup 2, The motor for 4 being provided with a turntable and rotating the optical disc 1, The drive circuit for [of a focus / in / in 5 / the optical pickup 2 /, tracking, slave control and the motor 4] carrying out drive controlling, When 6 performs servo controls, such as a roll control of a focus servo, a tracking servo, a SUREJJI servo, and the motor 4, according to the regenerative signal from RF amplifier 3 and the signal read from the optical disc 1 is outputted as digital data (bit stream), it is a DSP servo circuit.

[0018]It is a decoder which 7 analyzes the digital data (bit stream) outputted from the

DSP servo circuit 6, separates every [, such as picture image data or voice data,] data type according to a case, and decodes each separated data, From the decoder 7, the signal (information) of a state with this refreshable output unit is outputted to output units which are not illustrated, such as audio equipment and video display apparatus.
[0019]8 is a jitter amount detecting circuit as a jitter amount detection means to detect the jitter amount of a regenerative signal based on the standard clock which considers the regenerative signal outputted from the optical pickup 2 as an input, and does not illustrate it.
[0020]9 is a parameter adjustment device, and it is a control circuit which manages control of the whole device, and in order to perform optimal reproduction motion, it controls adjustments (setting out) and those motion control of the parameter in RF amplifier 3 or the DSP servo circuit 6, and the decode operation in the decoder 7. The input indication signal from the input device (a keyboard and a remote control provided with two or more keys) which is not illustrated for a user operating it and directing reproduction control again is considered as an input, and the operation in the playback equipment based on it is controlled.
[0021]now, ** -- adjustment of the parameter in a device [like] is explained taking the case of adjustment of focus balance.
[0022]When playback equipment is equipped with the optical disc 1 of a reproduction object, rotation of the motor 3 is started via the driver 5 by control of the control circuit 9, and the optical disc 1 is made to rotate. And the optical pickup 2 is moved to the position of parameter adjustment, for example, a position with a distance [from the center of a disk] of R= 25 mm, From the optical pickup 2, the regenerative signal based on the recorded information is outputted by making reading of the information recorded on the optical disc with the focus of the optical pickup 2, and tracking control start.
[0023]The control circuit 9 for focus balance control, It is made to change at a predetermined step (usually regular intervals) about the value of the adjustable range beforehand set up in the focus balance value by changing the gains (gain over the signal from the optical pickup 2, etc.) about the focus balance of RF amplifier 3, etc., The jitter amount of the regenerative signal outputted from the optical pickup 2 in each changed focus balance value is detected in the jitter amount detecting circuit 8. The jitter amount detected to each focus balance value at this time is made into a primary jitter amount, this primary jitter amount contains a changed part independent of an adjust parameter, and the relation between a focus balance value and a primary jitter amount becomes like drawing 4.
[0024]The control circuit 9 will calculate the primary jitter amount to each focus balance value, and the secondary jitter amount which calculated the average of the primary jitter amount detected before and behind that at least as a jitter amount to each focus balance value, if the primary jitter amount about an adjustable range as shown in drawing 4 is obtained. In this example, the average of five continuous primary jitter amounts containing the primary jitter amount which corresponds to a following formula to one focus balance value (F(i)) as a secondary jitter amount so that it may be shown is made into the secondary jitter amount (J'(i)).
J'(i) -- the relation of the secondary jitter amount and focus balance value which were produced by making it = (J(i-2)+J(i-1)+J(i)+J(i+1)+J (i+2)) / Mr. 5 ** is shown in drawing 5. It turns out that the relation between a focus balance value ideal for parameter adjustment shown in drawing 2 and a jitter amount is approached, and changed parts other than an adjust parameter are removed in a secondary jitter amount so that clearly from drawing 5.
[0025]And the control circuit 9 adjusts focus balance based on a secondary jitter amount, In the case of drawing 5, it is decided that it will be the optimal focus balance value for

the information reproduction of the optical disc 1 equipped with the focus balance value in the point B now, and the gain about the focus balance in RF amplifier 3, etc. are adjusted.

[0026]After **(ing) and adjusting about other parameters required for the optimal reproduction motion, playback of the information on the optical disc 1 which is the original purpose is performed as follows. Namely, while the basis of control of the DSP servo circuit 6 and the optical disc 1 rotate by the motor 4 and the focus of the optical pickup 2, tracking, and thread control are performed, The regenerative signal according to the information recorded by the optical pickup 2 is read from the optical disc 1, the digital data (bit stream) based on the signal is outputted to the decoder 7 by the DSP servo circuit 6, an output unit is supplied from the decoder 7, and the reproducing output of information is carried out.

[0027]In the above-mentioned example, the control circuit 9 receives one focus balance value, While the optical disc 1 rotates one time, the jitter amount of two or more points is detected in the jitter amount detecting circuit 8 at the predetermined intervals (when an optical disc is CD and it is 4 m second interval and DVD, it is 1 m second interval), and it is good also as a primary jitter amount [as opposed to the focus balance value at that time for the average jitter amount]. Since the cycle based on rotation in a thing called a changed part resulting from the face deflection of a changed part or a disk by the rotation unevenness of the motor independent of an adjust parameter exists, By considering it as the average of a jitter amount which carried out multiple-times detection, while an optical disc rotates a primary jitter amount one time, it becomes possible to remove a part for such change further. and ** -- in the secondary jitter amount calculated from the primary jitter amount [like], since the relation between a secondary jitter amount like drawing 5 and a focus balance value can be close brought further from the state of drawing 2, it becomes possible to perform parameter adjustment for the optimal reproduction motion with sufficient accuracy.

[0028]Although the secondary jitter amount was the equivalent average of the primary jitter amount in this example, In order not to limit to this, structural or to cope with the circuit characteristic, For example, it may be made to take the average of a primary jitter amount which performed weighting to a primary jitter amount called $J(i-2):J(i-1):J(i):J(i+1):J(i+2) = 1:2:4:2:1$, and carried out weighting to it.

[0029]

[Effect of the Invention]When this invention performs parameter adjustment based on a jitter amount so that clearly from the above explanation, Change the value of an adjust parameter at a predetermined step, and the jitter amount obtained to each value of an adjust parameter is made into a primary jitter amount, A secondary jitter amount is calculated from an average (an equivalent average and a weighting average) with the primary jitter amount corresponding to each value of an adjust parameter, and the primary jitter amount corresponding to the value of the adjust parameter before and behind that at least, Since the value of an adjust parameter is adjusted based on the secondary jitter amount, adjustment of a parameter is attained where a changed part called a changed part resulting from the face deflection of a changed part or a disk by the rotation unevenness of a motor which makes a disk rotate is removed. And since the detection frequency of a jitter amount can be stopped few in that case, making excessive detection time of a jitter amount and adjusting time of a parameter is avoided.

[0030]It becomes possible to remove a part for the above change further by considering it as the average of a jitter amount which carried out multiple-times detection, while an optical disc rotates a primary jitter amount one time, and it becomes possible to adjust the value of an adjust parameter to a better thing.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is an outline lineblock diagram of the optical disk reproducing device concerning one example of this invention.

[Drawing 2]It is a figure showing typically the relation between a focus balance value and a jitter amount.

[Drawing 3]It is a figure explaining adjustment of focus balance.

[Drawing 4]It is a figure showing typically the relation between a focus balance value and a primary jitter amount.

[Drawing 5]It is a figure showing typically the relation between a focus balance value and a secondary jitter amount.

[Description of Notations]

1 Optical disc
2 Optical pickup
3 RF amplifier
4 Motor
5 Drive circuit
6 DSP servo circuit
7 Decoder
8 Jitter amount detecting circuit (jitter amount detection means)
9 Control circuit (parameter adjustment device)

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(54) PARAMETER ADJUSTING METHOD IN OPTICAL DISK REPRODUCING DEVICE, AND OPTICAL DISK REPRODUCING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a parameter adjusting method and a reproducing device using the same capable of removing the amount of variation caused by the rotational irregularity of a motor for rotationally driving a disk or caused by the surface wobbling of the disk, while suppressing that the detecting time of the jitter amount or the adjusting time of the parameter is excessively increased when the parameter is adjusted on the basis of the jitter amount.

SOLUTION: By changing values of the adjusting parameters at a prescribed step, the jitter amounts obtained for each value of the adjusting parameters are defined as primary jitter amounts, and a secondary jitter amount is calculated from the average (equivalent average or weighted average) of the primary jitter amounts corresponding to each value of the adjusting parameters and the primary jitter amounts corresponding to at least the values of the adjusting parameters before and after them, then the value of the adjusting parameter is adjusted in accordance with the secondary jitter amount.

CLAIMS

[Claim(s)]

[Claim 1]In a parameter adjustment method in an optical disk reproducing device which adjusts a parameter of playback equipment based on a jitter amount of a regenerative signal from an optical disc, Change a value of an adjust parameter at a predetermined step, detect a primary jitter amount to each value of an adjust parameter, and as a jitter amount to each value of an adjust parameter, A secondary jitter amount which is an average with a primary jitter amount corresponding to each value of an adjust parameter and a primary jitter amount corresponding to a value of an adjust parameter before and behind that at least is calculated, A parameter adjustment method in an optical disk reproducing device adjusting a value of an adjust parameter based on a secondary jitter amount.

[Claim 2]A parameter adjustment method in the optical disk reproducing device according to claim 1, wherein a primary jitter amount is the average of a jitter amount which carried out multiple-times detection while rotating an optical disc one time.
[Claim 3]A parameter adjustment method in the optical disk reproducing device according to claim 1 or 2 being what carries out weighting of the operation of a secondary jitter amount to a primary jitter amount which calculates at a predetermined rate, and calculates the average.
[Claim 4]A jitter amount detection means to detect a jitter amount of a regenerative signal which it began to read from an optical disc.
A parameter adjustment device which adjusts a predetermined parameter based on a jitter amount detected by a jitter amount detection means.
Are the above the optical disk reproducing device which it had, and a parameter adjustment device, Change a value of an adjust parameter at a predetermined step, input a primary jitter amount to each value of an adjust parameter detected by a jitter amount detection means according to it, and as a jitter amount to each value of an adjust parameter, A secondary jitter amount which is an average with a primary jitter amount corresponding to each value of an adjust parameter and a primary jitter amount corresponding to a value of an adjust parameter before and behind that at least is calculated, and a value of an adjust parameter is adjusted based on a secondary jitter amount.

[Claim 5]The optical disk reproducing device according to claim 4 considering a parameter adjustment device as an average of two or more jitter amounts detected by a jitter amount detection means while rotating an optical disc one time as a primary jitter amount.
[Claim 6]The optical disk reproducing device according to claim 4 or 5, wherein it should carry out weighting of the parameter adjustment device to a primary jitter amount which calculates at a predetermined rate as a secondary jitter amount and it shall calculate the average.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the method of adjusting parameter value especially based on a jitter amount, about the adjustment method of the various parameters adjusted in order to perform reproduction motion the optimal in an optical disk reproducing device.
[0002]
[Description of the Prior Art]In the optical disk reproducing device which plays information from optical discs, such as CD from the former, MD, and DVD, In order to perform reproduction motion of the optical disc with which it was equipped the optimal, the jitter amount (a part for the time change to the standard clock of the reproduction clock obtained from a regenerative signal) of the regenerative signal (RF signal) read from the optical disc is detected, Based on this jitter amount, the value of the various parameters in reproduction motion is adjusted automatically so that a jitter amount may serve as the minimum. as the parameter adjusted -- a focus bias pressure value (for example, JP,7-44882,A.) Referring to JP,9-44864,A, a focus offset value (refer to JP,11-191225,A), a gain, focus balance of a focus error signal, etc. are mentioned.
[0003]For example, drawing 2 shows the relation between focus balance and a jitter

amount typically, and expresses change of the jitter amount when changing focus balance. Changing focus balance here When calculating each output from the quadrisected photo sensor which detects the returned light (catoptric light) of the laser beam which it was provided in the optical pickup and irradiated by the optical disc in a predetermined combination and acquiring a focus error signal, it is making the gain at the time of an operation adjust (change).
It is changing the balance (for example, a center level; refer to drawing 3) of S character curve which a focus error signal presents by this gain adjustment.

[0004]And a focus balance value is adjusted to the thing corresponding to the point A noting that in the case of drawing 2 a jitter amount is the minimum in the point A and the state (here, a focus balance value is called) of the focus balance corresponding to the point A is in the optimal state for reproduction motion.
[0005]
[Problem(s) to be Solved by the Invention]Now, when a parameter is adjusted automatically as mentioned above based on the jitter amount of a regenerative signal, The value of parameters other than an adjustment object was made immobilization, it changed the value of the parameter of an adjustment object, detected the jitter amount at that time, and has determined the optimal parameter value (for example, parameter value in case a jitter amount serves as the minimum).
[0006]However, a changed part resulting from the face deflection of a changed part or a disk by the rotation unevenness of a motor which makes a changed part independent of the parameter which can serve as an adjustment object, for example, a disk, rotate is contained in the jitter amount detected when changing parameter value. For this reason, it was difficult to acquire the point that a jitter amount serves as the minimum in order to come to show actually the jitter amount obtained when changing parameter value in drawing 4 and to determine the optimal parameter value.
[0007]Then, it is considering it as a jitter amount [as opposed to / as opposed to / for detection of the jitter amount in each changed parameter value / a multiple-times deed / each parameter value for the average], when changing the parameter value made into an adjustment object and detecting a jitter amount conventionally, A changed part resulting from the face deflection of a changed part or a disk by the rotation unevenness of a motor which makes a disk rotate was removed.
[0008]However, in order to fully remove a part for the above change, it is necessary to take the average of detection (measurement) Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. for very many jitter amounts to one parameter value. therefore -- in order to obtain the jitter amount (what was averaged) to each parameter value for parameter adjustment, very many jitter amounts must be detected -- the increase of detection time of a jitter amount -- size -- as a result, increase of the adjusting time of a parameter was caused. And since such time turns into a user's waiting time, it is anxious for time reduction.
[0009]this invention -- **, suppressing that the detection time of a jitter amount and the adjusting time of a parameter become excessive, when it was made in view of the point [like] and a parameter is adjusted based on a jitter amount. It aims at providing the playback equipment using the parameter adjustment method and it which can remove a changed part called a changed part resulting from the face deflection of a changed part or a disk by the rotation unevenness of a motor which makes a disk rotate.
[0010]
[Means for Solving the Problem]A parameter adjustment method in an optical disk reproducing device of this invention concerning claim 1, It is a parameter adjustment method in an optical disk reproducing device which adjusts a parameter of playback

equipment based on a jitter amount of a regenerative signal from an optical disc, Change a value of an adjust parameter at a predetermined step, detect a primary jitter amount to each value of an adjust parameter, and as a jitter amount to each value of an adjust parameter, A secondary jitter amount which is an average with a primary jitter amount corresponding to each value of an adjust parameter and a primary jitter amount corresponding to a value of an adjust parameter before and behind that at least is calculated, and a value of an adjust parameter is adjusted based on a secondary jitter amount.

[0011]A parameter adjustment method in an optical disk reproducing device of this invention concerning claim 2 is characterized by a primary jitter amount being the average of a jitter amount which carried out multiple-times detection while rotating an optical disc one time in the invention according to claim 1.

[0012]In the invention according to claim 1 or 2, a parameter adjustment method in an optical disk reproducing device of this invention concerning claim 3 carries out weighting of the operation of a secondary jitter amount to a primary jitter amount which calculates at a predetermined rate, and is characterized by being what calculates the average.

[0013]An optical disk reproducing device of this invention concerning claim 4, A jitter amount detection means to detect a jitter amount of a regenerative signal which it began to read from an optical disc, Are a parameter adjustment device which adjusts a predetermined parameter based on a jitter amount detected by a jitter amount detection means an optical disk reproducing device which it has, and a parameter adjustment device, Change a value of an adjust parameter at a predetermined step, input a primary jitter amount to each value of an adjust parameter detected by a jitter amount detection means according to it, and as a jitter amount to each value of an adjust parameter, A secondary jitter amount which is an average with a primary jitter amount corresponding to each value of an adjust parameter and a primary jitter amount corresponding to a value of an adjust parameter before and behind that at least is calculated, and a value of an adjust parameter is adjusted based on a secondary jitter amount.

[0014]In the invention according to claim 4, an optical disk reproducing device of this invention concerning claim 5 considers a parameter adjustment device as an average of two or more jitter amounts detected by a jitter amount detection means, while rotating an optical disc one time as a primary jitter amount.

[0015]In the invention according to claim 4 or 5, an optical disk reproducing device of this invention concerning claim 6 should carry out weighting of the parameter adjustment device to a primary jitter amount which calculates at a predetermined rate as a secondary jitter amount, and should calculate the average.

[0016]

[Embodiment of the Invention]Drawing 1 is an outline lineblock diagram of the optical disk reproducing device concerning one example of this invention, and plays DVD and CD as an optical disc.

[0017]An optical pickup for the optical disc in which information was recorded 1, and 2 to read the information currently recorded from the optical disc 1, An RF amplifier for 3 to amplify the regenerative signal (RF signal) outputted from the optical pickup 2, The motor for 4 being provided with a turntable and rotating the optical disc 1, The drive circuit for [of a focus / in / in 5 / the optical pickup 2 /, tracking, slave control and the motor 4] carrying out drive controlling, When 6 performs servo controls, such as a roll control of a focus servo, a tracking servo, a SUREJJI servo, and the motor 4, according to the regenerative signal from RF amplifier 3 and the signal read from the optical disc 1 is outputted as digital data (bit stream), it is a DSP servo circuit.

[0018]It is a decoder which 7 analyzes the digital data (bit stream) outputted from the

DSP servo circuit 6, separates every [, such as picture image data or voice data,] data type according to a case, and decodes each separated data, From the decoder 7, the signal (information) of a state with this refreshable output unit is outputted to output units which are not illustrated, such as audio equipment and video display apparatus.
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[0020]9 is a parameter adjustment device, and it is a control circuit which manages control of the whole device, and in order to perform optimal reproduction motion, it controls adjustments (setting out) and those motion control of the parameter in RF amplifier 3 or the DSP servo circuit 6, and the decode operation in the decoder 7. The input indication signal from the input device (a keyboard and a remote control provided with two or more keys) which is not illustrated for a user operating it and directing reproduction control again is considered as an input, and the operation in the playback equipment based on it is controlled.
[0021]now, ** -- adjustment of the parameter in a device [like] is explained taking the case of adjustment of focus balance.
[0022]When playback equipment is equipped with the optical disc 1 of a reproduction object, rotation of the motor 3 is started via the driver 5 by control of the control circuit 9, and the optical disc 1 is made to rotate. And the optical pickup 2 is moved to the position of parameter adjustment, for example, a position with a distance [from the center of a disk] of R= 25 mm, From the optical pickup 2, the regenerative signal based on the recorded information is outputted by making reading of the information recorded on the optical disc with the focus of the optical pickup 2, and tracking control start.
[0023]The control circuit 9 for focus balance control, It is made to change at a predetermined step (usually regular intervals) about the value of the adjustable range beforehand set up in the focus balance value by changing the gains (gain over the signal from the optical pickup 2, etc.) about the focus balance of RF amplifier 3, etc., The jitter amount of the regenerative signal outputted from the optical pickup 2 in each changed focus balance value is detected in the jitter amount detecting circuit 8. The jitter amount detected to each focus balance value at this time is made into a primary jitter amount, this primary jitter amount contains a changed part independent of an adjust parameter, and the relation between a focus balance value and a primary jitter amount becomes like drawing 4.
[0024]The control circuit 9 will calculate the primary jitter amount to each focus balance value, and the secondary jitter amount which calculated the average of the primary jitter amount detected before and behind that at least as a jitter amount to each focus balance value, if the primary jitter amount about an adjustable range as shown in drawing 4 is obtained. In this example, the average of five continuous primary jitter amounts containing the primary jitter amount which corresponds to a following formula to one focus balance value (F(i)) as a secondary jitter amount so that it may be shown is made into the secondary jitter amount (J'(i)).
J'(i) -- the relation of the secondary jitter amount and focus balance value which were produced by making it = (J(i-2)+J(i-1)+J(i)+J(i+1)+J (i+2)) / Mr. 5 ** is shown in drawing 5. It turns out that the relation between a focus balance value ideal for parameter adjustment shown in drawing 2 and a jitter amount is approached, and changed parts other than an adjust parameter are removed in a secondary jitter amount so that clearly from drawing 5.
[0025]And the control circuit 9 adjusts focus balance based on a secondary jitter amount, In the case of drawing 5, it is decided that it will be the optimal focus balance value for

the information reproduction of the optical disc 1 equipped with the focus balance value in the point B now, and the gain about the focus balance in RF amplifier 3, etc. are adjusted.

[0026]After **(ing) and adjusting about other parameters required for the optimal reproduction motion, playback of the information on the optical disc 1 which is the original purpose is performed as follows. Namely, while the basis of control of the DSP servo circuit 6 and the optical disc 1 rotate by the motor 4 and the focus of the optical pickup 2, tracking, and thread control are performed, The regenerative signal according to the information recorded by the optical pickup 2 is read from the optical disc 1, the digital data (bit stream) based on the signal is outputted to the decoder 7 by the DSP servo circuit 6, an output unit is supplied from the decoder 7, and the reproducing output of information is carried out.

[0027]In the above-mentioned example, the control circuit 9 receives one focus balance value, While the optical disc 1 rotates one time, the jitter amount of two or more points is detected in the jitter amount detecting circuit 8 at the predetermined intervals (when an optical disc is CD and it is 4 m second interval and DVD, it is 1 m second interval), and it is good also as a primary jitter amount [as opposed to the focus balance value at that time for the average jitter amount]. Since the cycle based on rotation in a thing called a changed part resulting from the face deflection of a changed part or a disk by the rotation unevenness of the motor independent of an adjust parameter exists, By considering it as the average of a jitter amount which carried out multiple-times detection, while an optical disc rotates a primary jitter amount one time, it becomes possible to remove a part for such change further. and ** -- in the secondary jitter amount calculated from the primary jitter amount [like], since the relation between a secondary jitter amount like drawing 5 and a focus balance value can be close brought further from the state of drawing 2, it becomes possible to perform parameter adjustment for the optimal reproduction motion with sufficient accuracy.

[0028]Although the secondary jitter amount was the equivalent average of the primary jitter amount in this example, In order not to limit to this, structural or to cope with the circuit characteristic, For example, it may be made to take the average of a primary jitter amount which performed weighting to a primary jitter amount called $J(i-2):J(i-1):J(i):J(i+1):J(i+2) = 1:2:4:2:1$, and carried out weighting to it.

[0029]

[Effect of the Invention]When this invention performs parameter adjustment based on a jitter amount so that clearly from the above explanation, Change the value of an adjust parameter at a predetermined step, and the jitter amount obtained to each value of an adjust parameter is made into a primary jitter amount, A secondary jitter amount is calculated from an average (an equivalent average and a weighting average) with the primary jitter amount corresponding to each value of an adjust parameter, and the primary jitter amount corresponding to the value of the adjust parameter before and behind that at least, Since the value of an adjust parameter is adjusted based on the secondary jitter amount, adjustment of a parameter is attained where a changed part called a changed part resulting from the face deflection of a changed part or a disk by the rotation unevenness of a motor which makes a disk rotate is removed. And since the detection frequency of a jitter amount can be stopped few in that case, making excessive detection time of a jitter amount and adjusting time of a parameter is avoided.

[0030]It becomes possible to remove a part for the above change further by considering it as the average of a jitter amount which carried out multiple-times detection, while an optical disc rotates a primary jitter amount one time, and it becomes possible to adjust the value of an adjust parameter to a better thing.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is an outline lineblock diagram of the optical disk reproducing device concerning one example of this invention.

[Drawing 2]It is a figure showing typically the relation between a focus balance value and a jitter amount.

[Drawing 3]It is a figure explaining adjustment of focus balance.

[Drawing 4]It is a figure showing typically the relation between a focus balance value and a primary jitter amount.

[Drawing 5]It is a figure showing typically the relation between a focus balance value and a secondary jitter amount.

[Description of Notations]

1 Optical disc
2 Optical pickup
3 RF amplifier
4 Motor
5 Drive circuit
6 DSP servo circuit
7 Decoder
8 Jitter amount detecting circuit (jitter amount detection means)
9 Control circuit (parameter adjustment device)

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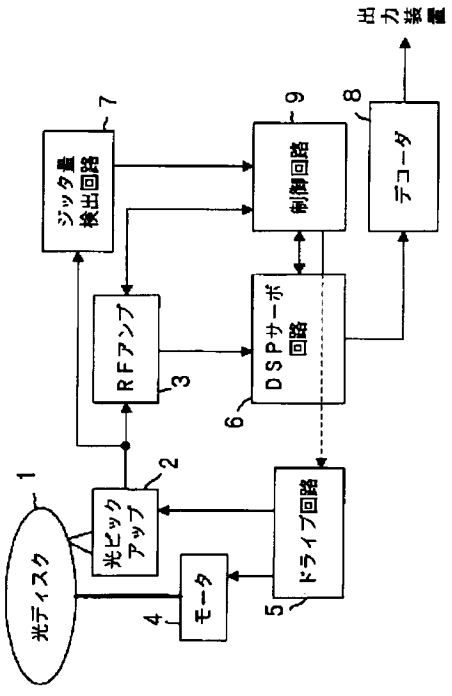
最終頁に続く

(54)【発明の名称】　光ディスク再生装置におけるパラメータ調整方法及び光ディスク再生装置

(57)【要約】
【課題】　ジッタ量に基づいてパラメータの調整を行う際に、ジッタ量の検出時間やパラメータの調整時間が過大になることを抑えつつ、ディスクを回転駆動させるモータの回転ムラによる変動分やディスクの面振れに起因する変動分といった変動分を除去することができるパラメータ調整方法及びそれを用いた再生装置を提供する事を目的とする。
【解決手段】　調整パラメータの値を所定のステップで変化させ、調整パラメータの各々の値に対して得られたジッタ量を一次ジッタ量とし、調整パラメータの各々の値に対応する一次ジッタ量と少なくともその前後の調整パラメータの値に対応する一次ジッタ量との平均（等価平均や重み付け平均）から二次ジッタ量を演算し、その二次ジッタ量に基づいて調整パラメータの値を調整する。



【特許請求の範囲】
【請求項１】　光ディスクからの再生信号のジッタ量に基づいて再生装置のパラメータの調整を行う光ディスク再生装置におけるパラメータ調整方法において、
調整パラメータの値を所定のステップで変化させ、調整パラメータの各値に対する一次ジッタ量を検出し、調整パラメータの各々の値に対するジッタ量として、調整パラメータの各々の値に対応する一次ジッタ量と少なくともその前後の調整パラメータの値に対応する一次ジッタ量との平均である二次ジッタ量を演算し、二次ジッタ量に基づいて調整パラメータの値を調整することを特徴とする光ディスク再生装置におけるパラメータ調整方法。
【請求項２】　一次ジッタ量は光ディスクを１回転させる間に複数回検出したジッタ量の平均であることを特徴とする請求項１に記載の光ディスク再生装置におけるパラメータ調整方法。
【請求項３】　二次ジッタ量の演算は、演算を行う一次ジッタ量に所定の割合で重み付けし、その平均を演算するものであることを特徴とする請求項１または２に記載の光ディスク再生装置におけるパラメータ調整方法。
【請求項４】　光ディスクからの読み出した再生信号のジッタ量を検出するジッタ量検出手段と、ジッタ量検出手段で検出されたジッタ量に基づいて所定のパラメータの調整を行うパラメータ調整手段とを備える光ディスク再生装置において、
パラメータ調整手段は、調整パラメータの値を所定のステップで変化させ、それに応じてジッタ量検出手段で検出される調整パラメータの各値に対する一次ジッタ量を入力し、調整パラメータの各々の値に対するジッタ量として、調整パラメータの各々の値に対応する一次ジッタ量と少なくともその前後の調整パラメータの値に対応する一次ジッタ量との平均である二次ジッタ量を演算し、二次ジッタ量に基づいて調整パラメータの値を調整することを特徴とする光ディスク再生装置。
【請求項５】　パラメータ調整手段は、一次ジッタ量として光ディスクを１回転させる間にジッタ量検出手段で検出した複数のジッタ量の平均とすることを特徴とする請求項４に記載の光ディスク再生装置。
【請求項６】　パラメータ調整手段は、二次ジッタ量として、演算を行う一次ジッタ量に所定の割合で重み付けし、その平均を演算したものとすることを特徴とする請求項４または５に記載の光ディスク再生装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、光ディスク再生装置において再生動作を最適に行うために調整される各種パラメータの調整方法に関し、特にジッタ量に基づいてパラメータ値を調整する方法に関するものである。
【０００２】
【従来の技術】従来からＣＤやＭＤやＤＶＤといった光ディスクから情報の再生を行う光ディスク再生装置においては、装着された光ディスクの再生動作を最適に行うために、光ディスクから読み出された再生信号（ＲＦ信号）のジッタ量（再生信号から得られる再生クロックの標準クロックに対する時間的変動分）を検出し、このジッタ量に基づいて、例えばジッタ量が最小となるように再生動作における各種パラメータの値を自動調整している。調整されるパラメータとしては、フォーカスバイアス電圧値（例えば特開平７―４４８８２号公報、特開平９－４４８６４号公報参照）やフォーカスオフセット値（特開平１１－１９１２２５号公報参照）、あるいはフォーカスエラー信号のゲインやフォーカスバランス等が挙げられる。
【０００３】例えば図２はフォーカスバランスとジッタ量との関係を模式的に示したものであり、フォーカスバランスを変化させた時のジッタ量の変化を表している。ここで、フォーカスバランスを変化させるというのは、光ピックアップ内に設けられ光ディスクに照射されたレーザビームの戻り光（反射光）を検出する４分割された受光センサからの夫々の出力を所定の組み合わせで演算してフォーカスエラー信号を得る際に、演算時のゲインを調整（変化）させることであり、このゲイン調整によりフォーカスエラー信号が呈するＳ字カーブのバランス（例えば中心レベル；図３参照）を変化させることである。
【０００４】そして図２の場合、点Ａにおいてジッタ量が最小であり、点Ａに対応するフォーカスバランスの状態（ここではフォーカスバランス値と称する）が再生動作に最適な状態であるとして、フォーカスバランス値は点Ａに対応するものに調整される。
【０００５】
【発明が解決しようとする課題】さて、上述のように、再生信号のジッタ量に基づいてパラメータの自動調整を行う場合、調整対象以外のパラメータの値は固定にしておき、調整対象のパラメータの値を変化させその時のジッタ量を検出して最適なパラメータ値（例えばジッタ量が最小となるときのパラメータ値）を決定している。
【０００６】しかしながら、パラメータ値を変化させたときに検出されるジッタ量には、調整対象となりうるパラメータに依存しない変動分、例えばディスクを回転駆動させるモータの回転ムラによる変動分やディスクの面振れに起因する変動分が含まれる。このためパラメータ値を変化させた時に得られるジッタ量は実際には図４に示すようになり、最適なパラメータ値を決定するための、例えばジッタ量が最小となる点を得ることが困難であった。
【０００７】そこで従来は、調整対象とするパラメータ値を変化させてジッタ量を検出する際に、変化させた個々のパラメータ値でのジッタ量の検出を複数回行い、その平均を個々のパラメータ値に対するジッタ量とするこ

とで、ディスクを回転駆動させるモータの回転ムラによる変動分やディスクの面振れに起因する変動分を除去していた。

【０００８】しかし、上述のような変動分を十分に除去するためには、１つのパラメータ値に対して非常に多くのジッタ量を検出（測定）しその平均をとる必要がある。従って、パラメータ調整のために、個々のパラメータ値に対するジッタ量（平均したもの）を得るためには非常に多くのジッタ量の検出を行わなくてはならず、ジッタ量の検出時間の増大ひいてはパラメータの調整時間の増大を招いていた。そしてこれらの時間は使用者の待ち時間となるため、時間短縮が切望されている。

【０００９】本発明は、斯様な点に鑑みてなされたもので、ジッタ量に基づいてパラメータの調整を行う際に、ジッタ量の検出時間やパラメータの調整時間が過大になることを抑えつつ、ディスクを回転駆動させるモータの回転ムラによる変動分やディスクの面振れに起因する変動分といった変動分を除去することができるパラメータ調整方法及びそれを用いた再生装置を提供する事を目的とするものである。

【００１０】

【課題を解決するための手段】請求項１に係る本発明の光ディスク再生装置におけるパラメータ調整方法は、光ディスクからの再生信号のジッタ量に基づいて再生装置のパラメータの調整を行う光ディスク再生装置におけるパラメータ調整方法であって、調整パラメータの値を所定のステップで変化させ、調整パラメータの各値に対する一次ジッタ量を検出し、調整パラメータの各々の値に対するジッタ量として、調整パラメータの各々の値に対応する一次ジッタ量と少なくともその前後の調整パラメータの値に対応する一次ジッタ量との平均である二次ジッタ量を演算し、二次ジッタ量に基づいて調整パラメータの値を調整することを特徴とする。

【００１１】請求項２に係る本発明の光ディスク再生装置におけるパラメータ調整方法は、請求項１に記載の発明において、一次ジッタ量は光ディスクを１回転させる間に複数回検出したジッタ量の平均であることを特徴とする。

【００１２】請求項３に係る本発明の光ディスク再生装置におけるパラメータ調整方法は、請求項１または２に記載の発明において、二次ジッタ量の演算は、演算を行う一次ジッタ量に所定の割合で重み付けし、その平均を演算するものであることを特徴とする。

【００１３】請求項４に係る本発明の光ディスク再生装置は、光ディスクからの読み出した再生信号のジッタ量を検出するジッタ量検出手段と、ジッタ量検出手段で検出されたジッタ量に基づいて所定のパラメータの調整を行うパラメータ調整手段とを備える光ディスク再生装置であって、パラメータ調整手段は、調整パラメータの値を所定のステップで変化させ、それに応じてジッタ量検出手段で検出される調整パラメータの各値に対する一次ジッタ量を入力し、調整パラメータの各々の値に対するジッタ量として、調整パラメータの各々の値に対応する一次ジッタ量と少なくともその前後の調整パラメータの値に対応する一次ジッタ量との平均である二次ジッタ量を演算し、二次ジッタ量に基づいて調整パラメータの値を調整することを特徴とする。

【００１４】請求項５に係る本発明の光ディスク再生装置は、請求項４に記載の発明において、パラメータ調整手段は、一次ジッタ量として光ディスクを１回転させる間にジッタ量検出手段で検出した複数のジッタ量の平均とすることを特徴とする。

【００１５】請求項６に係る本発明の光ディスク再生装置は、請求項４または５に記載の発明において、パラメータ調整手段は、二次ジッタ量として、演算を行う一次ジッタ量に所定の割合で重み付けし、その平均を演算したものとすることを特徴とする。

【００１６】

【発明の実施の形態】図１は本発明の一実施例に係る光ディスク再生装置の概略構成図であり、光ディスクとして例えばＤＶＤやＣＤを再生するものである。

【００１７】１は情報が記録された光ディスク、２は光ディスク１から記録されている情報を読み出すための光ピックアップ、３は光ピックアップ２から出力される再生信号（ＲＦ信号）を増幅するためのＲＦアンプ、４はターンテーブルを備え光ディスク１を回転させるためのモータ、５は光ピックアップ２におけるフォーカス、トラッキング、スレーブ制御及びモータ４の駆動制御するためのドライブ回路、６はＲＦアンプ３からの再生信号に応じてフォーカスサーボ、トラッキングサーボ、スレッジサーボ及びモータ４の回転制御等のサーボ制御を行うと共に光ディスク１から読み出した信号をデジタルデータ（ビットストリーム）として出力するとＤＳＰサーボ回路である。

【００１８】７はＤＳＰサーボ回路６から出力されるデジタルデータ（ビットストリーム）を解析し、場合に応じて映像データや音声データといったデータ種別毎の分離を行い、分離した夫々のデータのデコードを行うデコーダで、デコーダ７からは音響機器や映像表示機器といった図示しない出力装置へと該出力装置が再生可能な状態の信号（情報）が出力される。

【００１９】８は光ピックアップ２から出力される再生信号を入力とし、図示しない標準クロックに基づいて再生信号のジッタ量を検出するジッタ量検出手段としてのジッタ量検出回路である。

【００２０】９はパラメータ調整手段であると共に装置全体の制御を司る制御回路で、最適な再生動作を行うためにＲＦアンプ３やＤＳＰサーボ回路６におけるパラメータの調整（設定）やそれらの動作制御、またデコーダ７におけるデコード動作の制御を行う。更にまた、使用

者が操作して再生制御を指示するための図示しない入力装置（複数のキーを備えるキーボードやリモコン）からの入力指示信号を入力とし、それに基づいた再生装置における動作の制御を行う。

【００２１】さて、斯様な装置におけるパラメータの調整についてフォーカスバランスの調整を例にとって説明する。

【００２２】再生対象の光ディスク１が再生装置に装着されると制御回路９の制御によりドライバ５を介してモータ３の回転を開始し光ディスク１を回転駆動させる。そして光ピックアップ２をパラメータ調整の所定の位置、例えばディスクの中心からの距離Ｒ＝２５mmの位置に移動させ、光ピックアップ２のフォーカス、トラッキング制御と共に光ディスクに記録された情報の読取りを開始させることにより、光ピックアップ２からは記録された情報に基づいた再生信号が出力される。

【００２３】制御回路９は、フォーカスバランス調整のために、ＲＦアンプ３のフォーカスバランスに関するゲイン等（光ピックアップ２からの信号に対するゲイン等）を変化させることでフォーカスバランス値を予め設定されている調整範囲の値について所定のステップ（通常は等間隔）で変化させ、変化させた各々のフォーカスバランス値において光ピックアップ２から出力された再生信号のジッタ量をジッタ量検出回路８で検出する。この時の各フォーカスバランス値に対して検出されたジッタ量を一次ジッタ量とし、この一次ジッタ量は調整パラメータに依存しない変動分を含んでいるものであり、フォーカスバランス値と一次ジッタ量との関係は図４のようになる。

【００２４】制御回路９は、図４に示すような調整範囲についての一次ジッタ量が得られると、各フォーカスバランス値に対するジッタ量として、各フォーカスバランス値に対する一次ジッタ量と少なくともその前後に検出された一次ジッタ量の平均を演算した二次ジッタ量を求める。本実施例では、二次ジッタ量としては次式に示すように、１つのフォーカスバランス値（Ｆ(i)）に対して、対応する一次ジッタ量を含む連続する５つの一次ジッタ量の平均を二次ジッタ量（Ｊ′(i)）としている。

Ｊ′(i)＝（Ｊ(i−2)＋Ｊ(i−1)＋Ｊ(i)＋Ｊ(i+1)＋Ｊ(i+2)）／５

斯様にして得られた二次ジッタ量とフォーカスバランス値との関係を図５に示す。図５から明らかなように、図２に示すパラメータ調整には理想的なフォーカスバランス値とジッタ量の関係に近づいており、二次ジッタ量においては調整パラメータ以外の変動分が除去されていることが分かる。

【００２５】そして、制御回路９は二次ジッタ量に基づいてフォーカスバランスの調整を行い、図５の場合は点Ｂにおけるフォーカスバランス値を現在装着されている光ディスク１の情報再生に最適なフォーカスバランス値に決定し、ＲＦアンプ３におけるフォーカスバランスに関するゲイン等を調整する。

【００２６】而して、最適な再生動作のために必要な他のパラメータについても調整を行った後、本来の目的である光ディスク１の情報の再生が次のように行われる。即ち、ＤＳＰサーボ回路６の制御のもと、光ディスク１がモータ４により回転され、光ピックアップ２のフォーカス、トラッキング及びスレッド制御が行われながら、光ディスク１から光ピックアップ２により記録された情報に応じた再生信号が読み出され、ＤＳＰサーボ回路６によりその信号に基づくデジタルデータ（ビットストリーム）がデコーダ７へと出力され、デコーダ７から出力装置へと供給されて、情報の再生出力がされる。

【００２７】尚、上記実施例において、制御回路９は、１つのフォーカスバランス値に対して、光ディスク１が１回転する間に所定の間隔（例えば、光ディスクがＣＤであるときには４m秒間隔、ＤＶＤである時は１m秒間隔）で複数点のジッタ量をジッタ量検出回路８で検出し、その平均ジッタ量をその時のフォーカスバランス値に対する一次ジッタ量としても良い。調整パラメータに依存しないモータの回転ムラによる変動分やディスクの面振れに起因する変動分といったものは回転に基づく周期が存在するため、一次ジッタ量を光ディスクが１回転する間において複数回検出したジッタ量の平均とすることで、そのような変動分を更に除去することが可能になる。そして、斯様な一次ジッタ量から演算された二次ジッタ量においては、図５のような二次ジッタ量とフォーカスバランス値との関係を図２の状態へとより一層近づけることができるので、更に精度良く最適な再生動作のためのパラメータ調整を行うことが可能になる。

【００２８】また、本実施例では、二次ジッタ量は一次ジッタ量の等価平均であったが、これに限定する必要はなく、機構的あるいは回路的特性に対処するために、例えば、

Ｊ(i−2)：Ｊ(i−1)：Ｊ(i)：Ｊ(i+1)：Ｊ(i+2)）＝１：２：４：２：１

といった一次ジッタ量に重み付けを行い、重み付けした一次ジッタ量の平均を取るようにしても良い。

【００２９】

【発明の効果】本発明は、以上の説明から明らかなように、ジッタ量に基づいてパラメータ調整を行う場合に、調整パラメータの値を所定のステップで変化させ、調整パラメータの各々の値に対して得られたジッタ量を一次ジッタ量とし、調整パラメータの各々の値に対応する一次ジッタ量と少なくともその前後の調整パラメータの値に対応する一次ジッタ量との平均（等価平均や重み付け平均）から二次ジッタ量を演算し、その二次ジッタ量に基づいて調整パラメータの値を調整しているので、ディスクを回転駆動させるモータの回転ムラによる変動分やディスクの面振れに起因する変動分といった変動分を除

去した状態でパラメータの調整が可能になる。そして、その際にはジッタ量の検出回数を少なく抑えることができるので、ジッタ量の検出時間やパラメータの調整時間を過大にすることが避けられる。

【００３０】また、一次ジッタ量を光ディスクが１回転する間において複数回検出したジッタ量の平均とすることで、上述のような変動分を更に除去することが可能になり、調整パラメータの値をより良好なものに調整することが可能になる。

【図面の簡単な説明】

【図１】本発明の一実施例に係る光ディスク再生装置の概略構成図である。

【図２】フォーカスバランス値とジッタ量との関係を模式的に示す図である。

【図３】フォーカスバランスの調整を説明する図である。

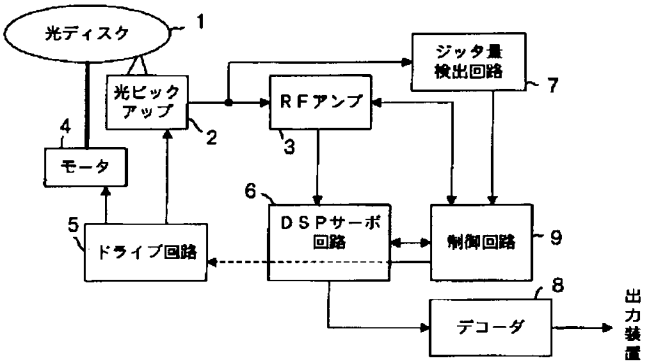
【図４】フォーカスバランス値と一次ジッタ量との関係を模式的に示す図である。

【図５】フォーカスバランス値と二次ジッタ量との関係を模式的に示す図である。

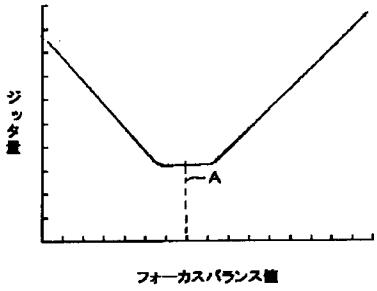
【符号の説明】

1　光ディスク
2　光ピックアップ
3　ＲＦアンプ
4　モータ
5　ドライブ回路
6　ＤＳＰサーボ回路
7　デコーダ
8　ジッタ量検出回路（ジッタ量検出手段）
9　制御回路（パラメータ調整手段）

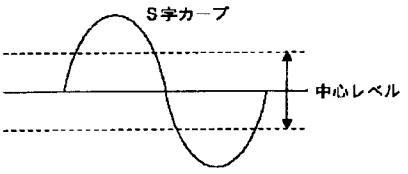
【図１】



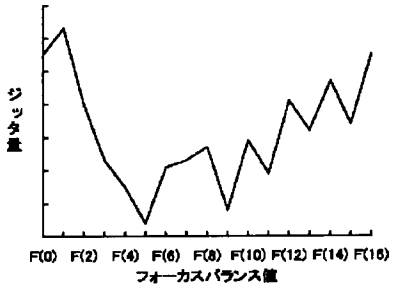
【図２】



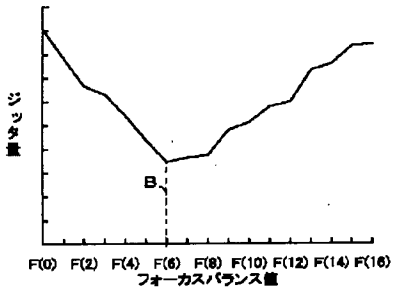
【図３】



【図４】



【図５】



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